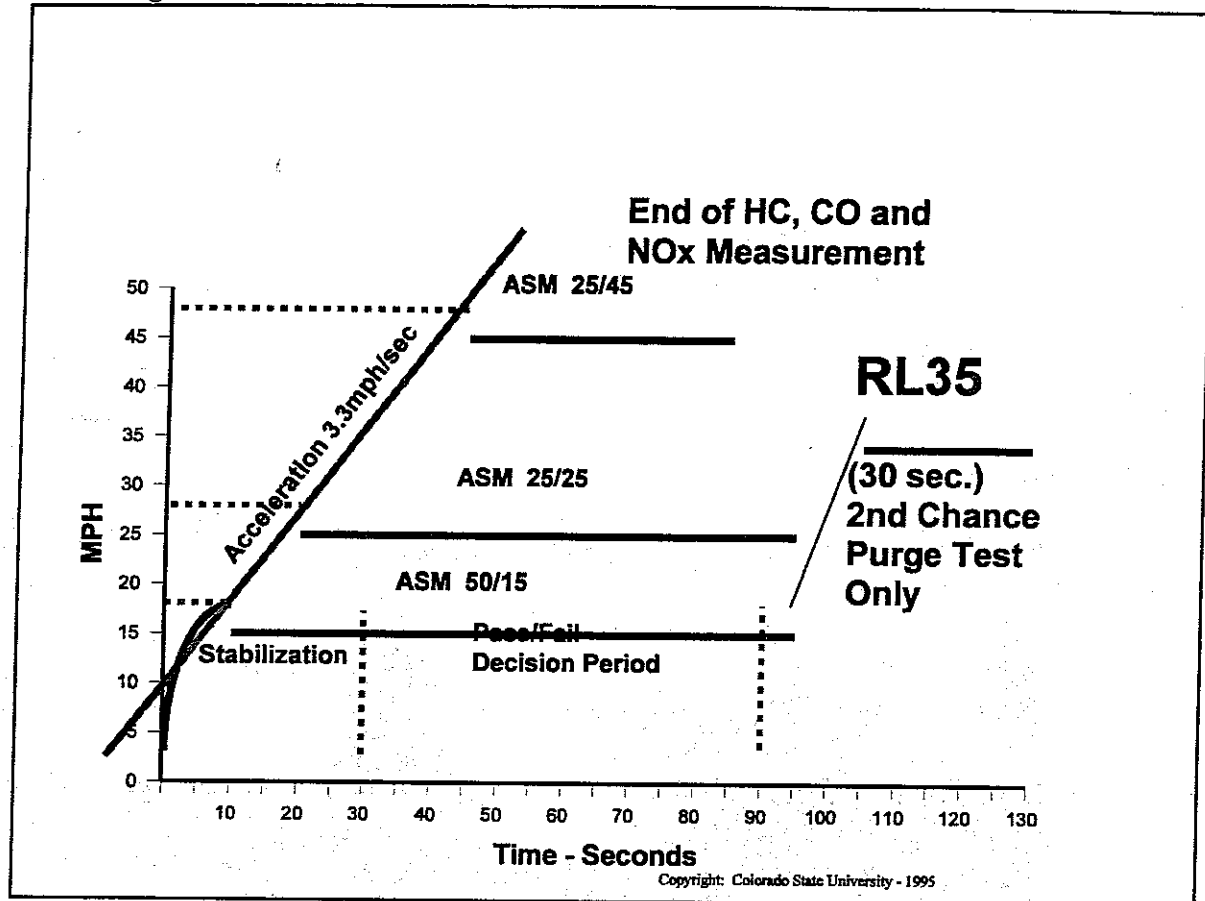


UNDERSTANDING ASM TEST PROCEDURES

DEVELOPMENT OF ASM DRIVING TRACE/CYCLE/SCHEDULE

ASM Background:



ASM Trace/Cycle Development

- Developed in 1988 by Sierra Research and Southwest Research Institute under contract to the California Bureau of Automotive Repair (BAR). The overall objectives of the BAR project were to evaluate alternative test procedures that might prove simpler and more practical in the private garage (decentralized) environment than transient testing.
- Uses a commercial grade analyzer that evolved from BAR-90 technology.
- Current BAR-90 analyzers *may* be up-gradeable. It should be noted that some analyzers may not be up-gradable due to processor type and/or speed, bench compatibility, etc.

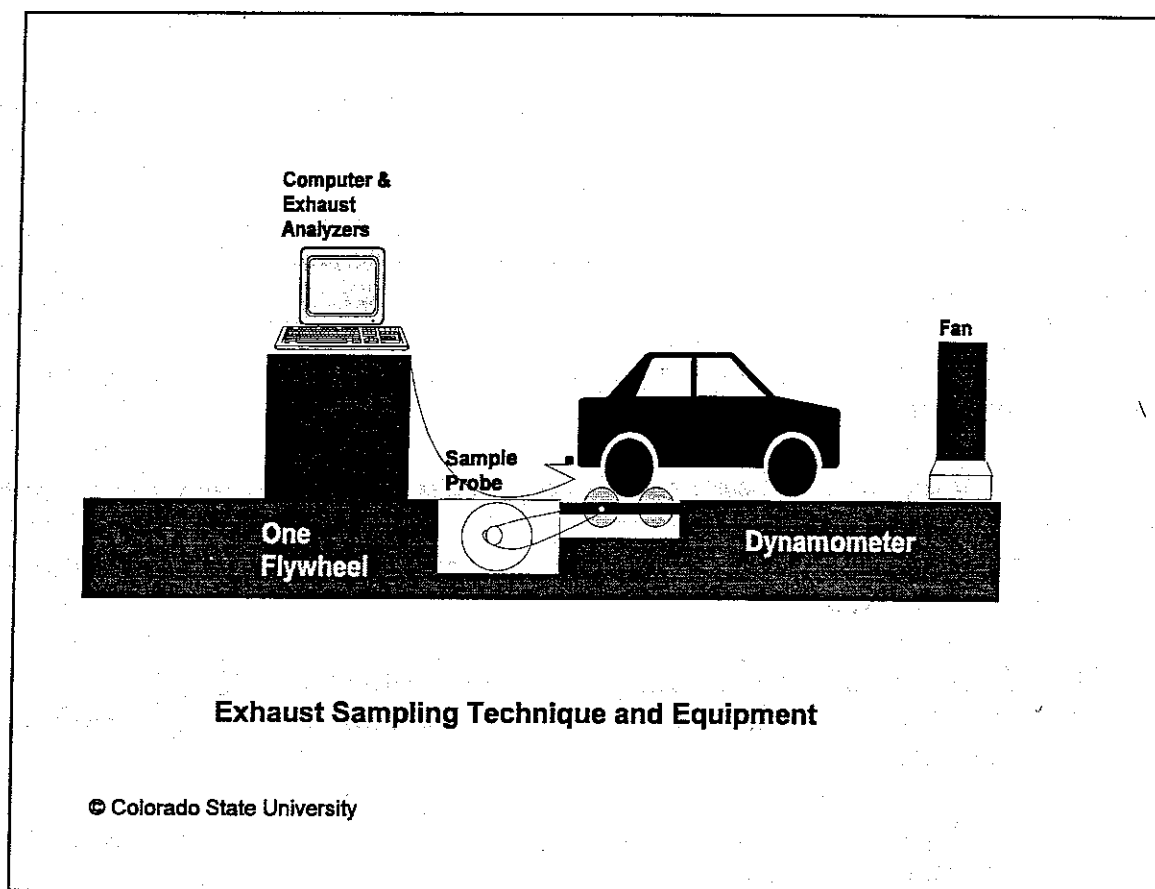
- Uses a dynamometer to *simulate* one or more acceleration modes at a *steady speed*. Horsepower settings are greater than normal cruise settings in order to simulate a load required to accelerate the vehicle.
- What the Numbers Mean:
 - * ASM 50/15 Mode = $50 / 15$ = Dynamometer load is 50% of the horsepower required to accelerate the vehicle at 3.3 mph per second @ 15 mph (± 1.0 mph).
 - * ASM 25/25 Mode = $25 / 25$ = Dynamometer load is 25% of the horsepower required to accelerate the vehicle at 3.3 mph per second @ 25 mph (± 1.0 mph).
- When the ASM 50/15 and the ASM 25/25 are combined they are referred to as an ASM-2.

ASM Test procedures:

- Vehicle is tested as received, all accessories off; no preconditioning before the test begins.
- The ambient temperature, absolute humidity, and barometric pressure is recorded up to 4 minutes before, or during, the test.
- The vehicle temperature gauge, if equipped and operating, shall be checked to assess engine temperature.
- Vehicle will be running at least 30 seconds prior to the beginning of the drive cycle.
- All horsepower settings are derived from an EPA look-up table that is based on vehicle curb weight + 300 lbs., and a specified vehicle speed; i.e. ASM 50/15 - Full sized van with a V8 engine will require approximately 19-20 hp. at 15 mph.
- Vehicle loading is accomplished by using a dynamometer Power Absorption Unit (PAU).
- When ambient conditions exceed 72°F, a cooling system blower will be used. The blower cannot be directed at the catalytic converter.
- Dynamometer must be warmed up prior to testing.
- Maximum mode length is 90 seconds. The maximum test length is 290 seconds.

- The mode timer will be reset to zero, and the drive trace restarted, if the vehicle speed falls outside a tolerance of ± 1 mph for more than 2 consecutive seconds or more than 5 seconds total.
- The vehicle is operated in drive (automatic) or second or third (manual/standard).
- Exhaust dilution; the sum of CO and CO₂ must be equal to at least 6% or the test is voided.

Vehicle Dynamometer:



ASM Equipment

- The inertia weight (minimum of 2000) allows for a smooth transition during the acceleration period prior to the start of the ASM test or the transition from a 50/15 to a 25/25 test mode.

- Dynamometer roll sizes may be either 8.5 or 21 inches.
- The amount of inertia weight selected is based on a consolidated list of new car certification settings for the vehicle make and model.

Sampling/Procedures:

ASM Exhaust Gas Measurement Calculation (Single Mode-50/15):

- The mode timer starts when the dynamometer speed is 15 ± 1.0 mph for 5 continuous seconds.
- Analysis and recording of exhaust gas concentrations begins 12 seconds (or sooner if system response time is faster) after the test mode timer starts.
- The pass/fail analysis of exhaust gas concentrations begins 25 seconds after the test mode timer starts.
- The vehicle passes the *partial stream sampling* test if, at any point between an elapsed time of 25 seconds and 90 seconds, the 10 second running average measured values for each pollutant are simultaneously less than or equal to the applicable test cutpoints.
- The maximum mode time is 90 seconds (for the first chance test) after the mode timer begins.
- If the vehicle fails the first-chance test, a second-chance test will be performed.
- If a second-chance test is used, the maximum test time is 145 seconds after the mode timer begins.

ASM Exhaust Gas Measurement Calculation (Two Mode-50/15 + 25/25):

All of the provisions listed above, for the single mode test, apply to the two mode test except that:

- After termination of the first mode (vehicle fails or timer is > 90 seconds), the vehicle is accelerated to the next mode.
- The second mode timer starts when vehicle speed is 25 ± 1.0 mph for 5 continuous seconds.
- If a second chance test is used, the maximum test time is 290 seconds after the mode timer begins if both modes are repeated.

Examples of *Potential* ASM Start-up Cutpoints By Model Year

ASM 50/15

Model Years (Light Duty Vehicles - ETW = 3500lbs)	HC (ppm <i>raw</i>)	CO (% <i>raw</i>)	NO _x (ppm <i>raw</i>)
1994+ Tier 1	78	.44	625
1991 - 1995 Pre Tier 1	124	.69	937
1983 - 1990	157	.88	1184
1981 - 1982	157	1.47	1184
1980	157	1.47	2668
1977 - 1979	397	2.05	2668
1975 - 1976	397	2.05	3669
1973 - 1974	573	4.17	3669
1968 - 1972	573	4.17	4002

ASM 25/25

Model Years (Light Duty Vehicles - ETW = 3500lbs)	HC (ppm <i>raw</i>)	CO (% <i>raw</i>)	NO _x (ppm <i>raw</i>)
1994+ Tier 1	76	.42	566
1991 - 1995 Pre Tier 1	120	.67	848
1983 - 1990	152	.97	1082
1981 - 1982	152	1.89	1082
1980	152	1.89	2486
1977 - 1979	390	2.82	2486
1975 - 1976	390	2.82	3418
1973 - 1974	563	5.92	3418
1968 - 1972	563	5.92	3728

Examples of *Potential* ASM Start-up Cutpoints By Vehicle Weight For MY 1983 To 1990

ASM 50/15

ETW (lbs)	HC (ppm)	CO (%)	NO _x (ppm)
2000	260	1.47	2058
3000	180	1.01	1378
4000	140	.79	1046
5000	117	.66	850
6000	100	.56	701
7000	91	.51	624

ASM 25/25

ETW (lbs)	HC (ppm)	CO (%)	NO _x (ppm)
2000	252	1.63	1877
3000	174	1.12	1258
4000	137	.87	956
5000	114	.73	778
6000	97	.62	642
7000	88	.56	573

VOLUME

Why do the cut-points decrease as vehicle weight increases?

Hint: See pages 10, 32, 33, and 37 for clues.